

What is claimed is:

1. A viscoelastic fluid consisting essentially of:

(a) an aqueous medium;

(b) a surfactant selected from the group consisting of amphoteric surfactants, zwitterionic surfactants, and mixtures thereof; and

(c) a member selected from the group consisting of organic acids, organic acid salts, inorganic salts, and combinations of one or more organic acids or organic acid salts with one or more inorganic salts; wherein said fluid exhibits the property of viscoelasticity.

2. The fluid as claimed in claim 1 wherein said amount of said surfactant is from about 0.5% to about 6% by weight of said fluid.

3. The fluid as claimed in claim 1 wherein said member is selected from the group consisting of organic acids and organic acid salts.

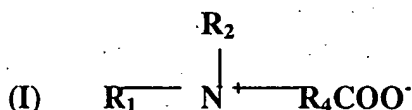
4. The fluid as claimed in claim 1 wherein said member is selected from the group of inorganic water-soluble salts.

5. The fluid as claimed in claim 1 wherein said surfactant is a zwitterionic surfactant comprising a quaternary ammonium hydrophilic moiety.

6. The fluid as claimed in claim 5 wherein the quaternary ammonium moiety of said zwitterionic surfactant is covalently bonded with an alkyl or a hydroxyalkyl group.

7. The fluid as claimed in claim 1 wherein said surfactant comprises a carboxylate hydrophilic moiety.

8. The fluid as claimed in claim 1 wherein said member comprises an aromatic moiety selected from the group consisting of sulfonic moieties, sulfonate moieties, carboxylic moieties, and carboxylate moieties.
9. The fluid as claimed in claim 8 wherein said aromatic moiety is selected from the group consisting of salicylate ions and phthalate ions, hydroxynaphthalene carboxylate ions, and mixtures thereof.
10. The fluid as claimed in claim 1 further comprising a particulate proppant suspended therein.
11. The fluid as claimed in claim 1 further comprising an additive selected from the group consisting of corrosion inhibitors and fluid-loss additives and mixtures thereof.
12. The fluid as claimed in claim 1 wherein said member is an inorganic salt.
13. The fluid as claimed in claim 1 wherein said member is an inorganic salt and is present in an amount of from about 0.1% to about 30% by weight.
14. The fluid as claimed in claim 1 wherein said member is an inorganic salt and is present in an amount of from about 0.1% to about 8% by weight.
15. The fluid as claimed in claim 1 wherein said member is an organic acid or salt thereof and is present in an amount of from about 0.1% to about 10% by weight.
16. The fluid as claimed in claim 1 wherein said member is an organic acid or salt thereof and is present in an amount of from about 0.1% to about 8% by weight.
17. The fluid as claimed in claim 1 wherein said surfactant is represented by the formula (I):





wherein R_1 represents alkyl, alkenyl, alkylarylalkylene, alkenylarylalkylene,
5 alkylaminoalkylene, alkenylaminoalkylene, alkylamidoalkylene, or alkenylamidoalkylene,
wherein each of said alkyl groups contain from about 14 to about 24 carbon atoms and may be
branched or straight chained and saturated or unsaturated, and wherein said alkylene groups
have from about 1 to about 6 carbon atoms,

R_2 and R_3 are independently aliphatic chains having from about 1 to about 30 carbon
10 atoms, and

R_4 is a hydrocarbyl radical with a chain length of about 1 to about 4.

18. The fluid of claim 17 wherein R_1 is selected from the group consisting of tetradecyl,
hexadecyl, octadecyl, and octadecyl.

19. The fluid of claim 17 wherein R_1 is an alkyl group derived from tallow, coco, soya
15 bean, or rapeseed oil.

20. The fluid of claim 17 wherein said alkyl and alkenyl groups of R_1 are selected from
alkyl groups and alkenyl groups respectively having from about 16 to about 22 carbon
atoms.

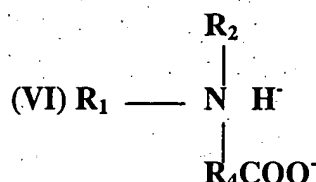
21. The fluid of claim 17 wherein R_2 and R_3 are independently alkyl, alkenyl, arylalkyl,
20 hydroxyalkyl, carboxyalkyl, or hydroxyalkyl-polyoxyalkylene, each having from
about 1 to about 10 carbon atoms.

22. The fluid of claim 17 wherein R_2 and R_3 are independently methyl, ethyl, benzyl,
hydroxyethyl, hydroxypropyl, carboxymethyl, or carboxyethyl.

23. The fluid of claim 17 wherein R_4 is methylene or ethylene.

25 24. The fluid of claim 17 wherein R_2 and R_3 are each beta-hydroxyethyl.

25. The fluid of claim 24 wherein R_1 is $RCONHCH_2CH_2CH_2-$ wherein R is an alkyl group containing from about 14 to about 24 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated.
26. The fluid of claim 17 wherein R_2 and R_3 are each methyl.
27. The fluid of claim 26 wherein R_1 is $RCONHCH_2CH_2CH_2-$ wherein R is an alkyl group containing from about 14 to about 24 carbon atom which may be branched or straight chained and which may be saturated or unsaturated.
28. The fluid of claim 1 wherein said surfactant is represented by formula (VI):



wherein R_1 represents alkyl, alkenyl, alkylarylalkylene, alkenylarylalkylene, alkylaminoalkylene, alkenylamino-alkylene, alkylamidoalkylene, or alkenylamidoalkylene, wherein each of said alkyl groups contain from about 14 to about 24 carbon atoms and may be branched or straight chained and saturated or unsaturated, and wherein said alkylene groups have from about 1 to about 6 carbon atoms,

R_2 is selected from the group of alkyl, alkenyl, arylalkyl, hydroxyalkyl, carboxyalkyl, and hydroxyalkyl-polyoxyalkylene, each having from about 1 to about 10 carbon atoms, and

R_4 is a hydrocarbyl radical with chain length of about 1 to about 4.

29. The fluid of claim 28 wherein R_2 is beta-carboxyethyl and R_4 is ethylene.

30. The fluid of claim 28 wherein R_1 is $RCONHCH_2CH_2CH_2-$ wherein R is an alkyl group containing from about 14 to about 24 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated.

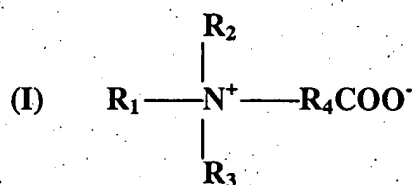
31. The fluid of claim 1 wherein said surfactant is dihydroxyethyl tallow glycinate.

32. The fluid of claim 1 wherein said surfactant is disodium tallowiminodipropionate.

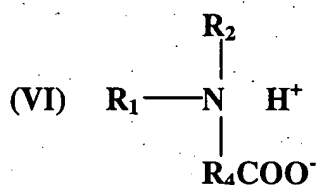
33. The fluid of claim 1 wherein said surfactant is oleamidopropyl betaine.

34. A viscoelastic fluid consisting essentially of:

- (1) an aqueous medium;
- (2) a surfactant selected from the group consisting of those of formula (I):



and those of formula (VI):



wherein R_1 represents alkyl having from about 16 to about 22 carbon atoms or $RCONHCH_2CH_2CH_2-$ wherein R is an alkyl group containing from about 16 to about 22 carbon atoms,

R_2 and R_3 are independently methyl, ethyl, benzyl, hydroxyethyl, hydroxypropyl, carboxymethyl, or carboxyethyl, and

R_4 is methylene or ethylene; and

(3) a member selected from the group of a) organic acids and salts thereof, wherein said organic acid or salt thereof comprises an aromatic moiety selected from the group consisting of sulfonate moieties and carboxylate moieties, b) inorganic salts selected from the group of water-soluble ammonium salts and c) combinations of one or more of said organic acids, or salts thereof, and one or more of said inorganic salts;

wherein said fluid exhibits the property of viscoelasticity.

35. The fluid of claim 34 wherein said surfactant is present in an amount of from about 0.5% to about 10%, said member is present in an amount of from about 0.1% to about 30%.

36. The fluid of claim 35 wherein said member is comprised of inorganic salts.

37. The fluid of claim 35 wherein said member comprises the combination of one or more of said organic acid, or salts thereof with one or more of said inorganic salts.

38. The fluid of claim 35 wherein said member is comprised of organic acids or salts thereof.

39. The fluid of claim 38 wherein said surfactant is selected from the group consisting of dihydroxyethyl glycinate, alkylamidopropyl betaines, and amphoteric imidazoline-derived dipropionates.

40. The fluid of claim 39 wherein said surfactant is dihydroxyethyl tallow glycinate.

41. The fluid of claim 39 wherein said surfactant is disodium tallowiminodipropionate.

42. The fluid of claim 39 wherein said surfactant is oleamidopropyl betaine.

43. A viscoelastic fluid comprising:

(1) an aqueous medium;

(2) from about 0.5% to about 6% of a surfactant selected from the group consisting of dihydroxyethyl tallow glycinate, tallowiminodipropionate, and oleamidopropyl betaine; and

(3) from about 0.1% to about 6% of a combination of a member selected from the group consisting of p-toluene sulfonate, napthalene sulfonate, chlorobenzoic acid, salicylic acid and phthalic acid, with a member comprising one or more water-soluble ammonium salts;

wherein said fluid exhibits the property of viscoelasticity.

44. A method of suspending solid particles of excavation by-products in a viscoelastic fluid, wherein the solid particles remain suspended for an extended period of time in a site, comprising the steps of transporting the fluid to a site while the solid particles remain suspended in the fluid and depositing the fluid to such site, wherein said viscoelastic fluid comprises:

(1) an aqueous medium;

(2) a surfactant selected from the group consisting of amphoteric surfactants, zwitterionic surfactants, and mixtures thereof; and

(3) a member selected from the group consisting of organic acids and salts thereof, inorganic salts, and combinations of one or more organic acids or salts thereof, with one or more inorganic salts;

wherein said fluid exhibits the property of viscoelasticity.

45. A method of fracturing a subterranean formation comprising the step of pumping a viscoelastic fluid through a wellbore and into a subterranean formation at a pressure sufficient to fracture the formation, wherein said viscoelastic fluid comprises;

(1) an aqueous medium;

(2) a surfactant selected from the group consisting of amphoteric surfactants, zwitterionic surfactants, and mixtures thereof; and

(3) a member selected from the group consisting of organic acids, organic acid salts, inorganic salts, and combinations of one or more organic acids or organic acid salts with one or more inorganic salts;

wherein said fluid exhibits the property of viscoelasticity.

46. The method of fracturing as claimed in claim 44 wherein said viscoelastic fluid is further comprised of a particulate proppant suspended therein.

47. An aqueous formulation of an agricultural chemical and an amount of a viscoelastic fluid sufficient to increase the average droplet size of a spray of said formulation, wherein said viscoelastic fluid comprises:

(1) an aqueous medium;

(2) a surfactant selected from the group consisting of amphoteric surfactants, zwitterionic surfactants, and mixtures thereof; and

(3) a member selected from the group consisting of organic acids, organic acid salts, inorganic salts, and combinations of one or more organic acids or organic acid salts with one or more inorganic salts;

wherein said fluid exhibits the property of viscoelasticity.

48. A viscoelastic fluid consisting essentially of:

(1) an aqueous medium;

(2) an amount of a surfactant comprising an amine oxide surfactant; and

(3) an anionic surfactant containing a hydrophobe having at least 14 carbon atoms;

$$\begin{array}{c} \text{R}_2 \\ | \\ \text{R}_1 - \text{N} \cdots \cdots \rightarrow \text{O} \\ | \\ \text{R}_3 \end{array}$$

R₂ and R₃ are independently aliphatic chains having from about 1 to about 30 carbon atoms.

51. The fluid according to claim 50 wherein alkyl represents a group that contains from about 16 to about 22 carbon atoms which may be branched or straight chained and which may be saturated or unsaturated.

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53. A method of fracturing a subterranean formation comprising the step of pumping a viscoelastic fluid through a wellbore and into a subterranean formation at a pressure sufficient to fracture the formation, wherein said viscoelastic fluid consists essentially of:

- (1) an aqueous medium;
- 5 (2) an amount of a surfactant comprising an amine oxide surfactant; and
- (3) an amount of an anionic surfactant containing a hydrophobe having at least 14 carbon atoms;

wherein said fluid exhibits the property of viscoelasticity.

54. The process according to claim 52 wherein said fracturing step takes place at

10 temperatures greater than about 100°F.